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PHYSICAL STATES OF CRIMINAL WOMEN.¹

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The study here presented was made with a view to determine to what extent inmates of the State Reformatory at Bedford Hills, N. Y., show physical abnormality and whether such abnormality bears any significant relation to that abnormality of behavior designated as criminal or delinquent for which these subjects have been committed. The larger idea of the study is in the interest of the criminal problem as a whole. Formulated specifically it is that since criminal manifestations have a more or less common external appearance they may have at bottom a cause more or less common to all. In order to discover that possible common cause a representative number of subjects showing criminal reactions must be studied in every aspect available to study and the results of that study must be scrutinized for points of agreement. This, it need hardly be said, is no new idea, but until recently no serious attempt has been made in any institution to push such a study to completion. If one representative institution should make such a thoroughgoing study and should divulge as a result anything even approximating a feature common to all it would be fair to assume that its showing would be an index of the population of the whole group of penal and reformatory institutions. In any event the results could be easily verified or disproved for other institutions. Interpretation of the criminal problem would then rest on definite co-ordinated facts instead of, as now, on shifting speculation. The difficulty in the way of making such a study lies obviously, in the well-nigh irreducible complexity of makeup of the adult human organism. Scientific study is restricted to a few arbitrary categories which separated out and evaluated may mean very different things from what they mean when functioning *in situ*. As usually construed the adult human organism is the product of three factors more or less completely separable and measurable, the physical, the psychological, the sociological, and of another, the hereditary factor, so subtly bound up with each of the others that its value as a separate entity cannot be accurately computed. This study deals with the physical factor only.

Our record form is essentially that used for any complete physical examination. It aims to cover as concisely and thoroughly as possible

¹A study made at the Laboratory of Social Hygiene of 200 women committed to the State Reformatory for Women at Bedford Hills, N. Y.

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the field of physical diagnosis except those features which require special technical equipment such as examination of urine, blood, spinal fluid, etc. The latter data should appear on separate appropriate forms according to usual hospital practice. The actual size of the form sheet is 11x8½ in. for use in correspondence size filing case. Both sides of the sheet are utilized. The entire reverse side is given to examination of the Nervous System. Space for detailed description of any significant finding is provided at the bottom of blank. Items of personal history usually recorded on medical histories such as age, birthplace, occupation, etc., are given no space in this form, although they appear in the statistical tables. These items are provided for in the records of the Sociological Department of the Laboratory of Social Hygiene and since the records of the several departments are mutually available repetition has been avoided by omitting from the medical blank whatever is provided for in the other departments. Certain items although noted on the blank were not recorded as routine practice, hence do not appear in the tabulation. For example, sitting height was measured in only a few cases in either group. In Group B. chest measure was not recorded. Record of hair and eye color were omitted from both groups. Under Neurological Examination several items recorded in Group A. were not recorded in Group B. The figures therefore for these items represent one hundred instead of two hundred cases. Ophthalmoscopic examination was made in no case because of the impossibility of having the services of an expert examiner. Examination of color, vision, of smell, of taste was not made a routine practice because at first sight tests of these functions seemed more properly to belong to the Department of Psychology. This is a cause for regret and for correction in later work. Since the effects of disorders of these functions, their interpretation and treatment belong to the field of medicine their examination should be included in a study of physical states in at least a sufficient number of cases to establish a norm for this type of subject.

The subject of a record form for physical examination is dwelt upon thus at length because of the fact that in spite of certain restrictions attaching to the use of a stereotyped form it is nevertheless the only means by which completeness and uniformity of procedure can be assured. While this form is by no means offered as an ideal still it is a guide to the extent to which examination must be carried if the physical status of the individual is to be determined. It is hoped that the publication of a sample record form may suggest to correctional institutions the need of adopting the use of similar examination records

in study of the prisoner. At present few institutions make any attempt to evaluate the physical status of the prisoner or to preserve data in permanent form. An investigation of this subject was made in 1914-1915 by the National Committee on Prisons. Questionnaires were sent to 192 correctional institutions in the United States. Of the 134 institutions which replied, 116 were found to make physical examinations more or less satisfactory of the prisoner on admission, but only 59 institutions kept adequate records of the examination.

Statistical data were tabulated in two separate groups of one hundred for two reasons: first for convenience of computation and second because it has been observed in the work of the Laboratory that in respect to the categories referred to above; one group of one hundred consecutive admissions runs curiously like another group. Results of this study appear to bear out this observation. In all details as our complete results indicate the two groups are strikingly similar. In most cases where a wide difference appears there is a natural explanation omitted here for lack of space. Obviously a study of two groups is insufficient to demonstrate generality of this observation but it strongly suggests that at least for the institution under consideration a group of one hundred consecutive cases is approximately a reduced facsimile of the entire population.

Tabulation of results is omitted here for lack of space.

Discussion will be limited to those items which appear to have some causal, contributory, or prognostic relation to abnormal conduct reactions.

PERSONAL HISTORY.

Personal History, precisely speaking, is not a topic pertinent to a study of physical states, yet because it is customarily included in medical records and because of certain data appearing under this head bearing clearly on the subject of delinquency it is included in this study. Average age has here no particular significance since with occasional exceptions the age limits of admission are arbitrarily fixed at sixteen and thirty years. The average age here falls below the median of the prescribed age limits and shows a tendency to preponderance of younger rather than older types. In practice, age of admission has little if any relation to age of incidence of delinquency since many cases have already served one or more sentences in other institutions before entering Bedford.

The items Birthplace, Religion, Race considered without reference to other facts have for our purpose no significance. The items Occupation, Education, Parental Status however have very

definite significance. The fact that nearly three-fourths of the cases came from domestic and factory employment and that only three and one-half per cent had engaged in anything as skilled as office work surely suggests that an occupational factor figures in the determination of delinquency. The fact that ten and one-half per cent are illiterate and that only three per cent completed grammar school indicates the extremely inadequate educational equipment of these subjects. The fact that forty-two per cent had, before the age of fifteen, disturbed home conditions through parental separation of one sort or another and that eleven per cent during some period of their childhood were inmates of orphan asylums are facts that hold the attention. These facts of personal history testify only once again to the unfavorable social and educational background of a reformatory population and indicate plainly enough the necessity for rectifying social defects before a start can be made towards prevention of delinquency.

PREVIOUS HEALTH.

Records under this head were made from testimony of the patient. For diseases of particular significance such as rheumatism, chorea, convulsions, traumata, etc., statements were verified by a field worker. The records are probably open to slight error owing to errors of memory of informant yet it is safe to conclude that in the course of minute, concrete questioning no really important malady has been overlooked. The data given, therefore, may be accepted as at least approximately correct. The relation of previous health conditions to subsequent modes of conduct is at present altogether speculative. To say that a constant correlation exists is presumptive in view of every day evidence that society exhibits a large number of persons of varying degrees of physical disability who are entirely free from criminal or delinquent conduct. Nevertheless it seems plain that a person whose physiological mechanisms have been disturbed during developmental period by morbid processes of one sort or another, as for example disorders of thyroid function, disease of middle ear, toxemias leading to disease of heart, spinal cord, eye, etc., must be classed with the handicapped and granted on this account extenuation if he fails to measure up to normal standards of achievement. Whatever part physical disease plays in the etiology of delinquency, it seems a waste of time to say, can be largely eliminated when preventable diseases are prevented. A record of measles 60%, scarlet fever 15%, acute rheuma-

tism 7% with their hampering sequellae could as well read zero if society and the medical profession put into practice the full measure of their knowledge. One of the most significant items under this head is that of convulsions, 14% having such a history. Of these 5½% are cases of unquestioned epilepsy. As an excitor of abnormal conduct in society and as a cause of mal-adjustment to the routine in correctional institutions variations of epilepsy like many other neuropathic reactions are frequently uninterpreted. It would seem the extreme of injustice to treat a case of epileptic excitement or a case of choreic instability by severe disciplinary measures as is now frequently done.

The record of pregnancy is of peculiar interest because of a kind of chronic apprehension on the part of a normal public lest their offspring should presently be out-numbered by the offspring of criminals, feeble-minded and the like. It appears from these records that from a total of 169 pregnancies only 60 living children remained at the time of this examination. It is true that 50% of the cases were never pregnant and since the average age is only slightly over twenty-one years it might be inferred that there was yet ample time for propagation. This inference has however not much weight since the high degree of venereal infection in these subjects makes sterility a probability. Moreover girls in institutions soon learn from one another the methods of preventing conception so that on leaving they are quite unlikely to give birth to children. Another fact lessening likelihood of numerous population from this source is the almost universally poor physical condition of the children born to these women. In general, they are marantic, rachitic babies, who die early.

One aspect of the question of pregnancy probably not sufficiently considered is early and involuntary pregnancy as a cause of abandonment of social for anti-social practices. It is quite common to find among girls who make up the reformatory population that pregnancy is often the initiation of delinquency. Being as she terms it "ruined," she has no ideal to look forward to, no incentive to resist crude sex instinct or to disregard it as an economic asset. Whether such cases should be forced into legalized status by enforced marriage wherever possible is, strange to say, a moot point amongst persons who have these cases under direction. As abstract ethical principle their attitude may have some soundness but it fades away in face of the practical fact that at present society demands as the sole means of making pregnancy respectable a marriage ceremony.

According to our present social standards the effect of unlegalized pregnancy on the mind of the human individual of whatever grade is depressing if not actually deteriorating. Since marriage is the sanction for bearing children it should be made as nearly universal as possible wherever pregnancy occurs.

Under the head of venereal diseases it will be noted that only 17½% give positive verbal history. This is anomalous in view of the 50% approximately who later by blood test show positive reactions. It emphasizes the fact that in so far as infections of venereal nature are often unknown to the subject they are a greater menace to the public. The probability of concealment from the examiner of the knowledge of infection need hardly be considered as explanation of this discrepancy for two reasons: First, because to offset such possibility histories were taken by questioning for symptoms without disclosing the diagnostic entity of the disease in question, and, second, because the subjects, as experience soon shows, are not sensitive or reticent in discussing their sex practices. On the contrary they are quite frank and business-like in talking of them.

Alcohol use is not higher than would be expected in this class of patients. Indeed its use is rather less general than might be expected and is more frequently a result or an accompaniment than an isolated cause of delinquency.

Laparotomy operations had been performed on 20% of the cases. It would seem that in the interest of constructive eugenics such operations might with highest ethical propriety be made the occasion for rendering these subjects sterile. In only three cases among the entire group had surgical sterilization occurred.

PRESENT PHYSICAL CONDITION.

Measurements.—Anthropometric data in a group of such different nationalities warrant little attention. It will be simply noted that the average height and weight of this group is .73 cm. shorter and 4.7 kg. heavier than the averages shown by Dr. D. A. Sargent³ for a group of over eighteen hundred women with an average age of twenty-one years.

Cephalic measurements bear out the fact already established that the cephalic index is smaller for a negro than for a Caucasian group. In general the cephalic index for the Caucasian group is small, 35% falling below an index of 80. This fact probably has direct relation

³Investigation Into Physique of Women (Massachusetts State Board of Health, 1880), by Professor H. P. Bowditch, M. D. (Dr. Sargent's statistics in comparative table, p. 13.)

to the generally low average of intelligence of the group. The smallest index (63) occurs in a feeble-minded epileptic girl. Anomalies of cranial contour of which there are many unfortunately are not indicated by these measurements.

Posture and Bodily Condition.—Posture is noted as good in only 37%. The others show slumping shoulders, flat chests, protruding abdomens and a generally poor carriage which matches well the inert, unambitious character of their practices and ideals. It is futile to expect to reform or to inculcate new ideals in these individuals until their bodies have been trained to new habits of posture. No person with organs pressed out of shape and vascular mechanisms restricted by faulty posture can be expected to make proper response to the demands of society.

Orthopedic Conditions.—Spinal curvature 15%, asymmetrical chest 10%, bow-legs 6%, knock-knee 7%, etc., are signs clearly indicative of bad hygiene in childhood, of prevalence of rachitis, marasmus, and of other nutritional disorders of preventable nature.

Stigmata of Degeneracy.—Whatever their relation to human biological fitness are at least deviations of aesthetic interest. It is probably archaic to try to demonstrate relationship between these anomalies of physical structure and abnormality of conduct. Nevertheless it cannot escape the notice of even a casual observer that viewed in a group the women of our study do present an undeniable oddity of appearance. When analyzed these oddities are found to consist chiefly of variations in cranial size and shape, and of a typical facial configurations of one sort or another. To what degree these deviations are dependent upon early nutritional and hygienic deficiencies already mentioned in other connections as well as upon the fact of biologic retrogression one would hesitate to offer an opinion.

Tegumentary System.—Items under this head are not of particular value to this study. Scars of traumatic origin (45%) other things being equal, are indicative of lack of intelligent care, those of inflammatory origin (12%) point to adverse metabolic influences, while surgical scars (22½%) indicate that intelligence of some degree has been brought to bear on the individual.

Glandular System.—Under this head we refer to those glands, lymphatic or secretory, accessible to external examination. Cervical hypertrophies (15%) point once again to faulty metabolism through bacterial infection. Inguinal hypertrophies (18%) are here chiefly associated with venereal infection. Thyroid hypertrophy (6½%) is an item which could well receive detailed consideration in view of the relatively

large number of cases showing mental and nervous disturbances incident to disordered thyroid function. It is unfortunate that other disorders of the so-called internal secretions can not show categorically on the examination blank in use. Disorders of pituitary function seem to be clearly diagnosable in three per cent of cases and it is highly probable that further study of certain interesting cases of obesity accompanied by mental hebetude and changed emotional tone would disclose etiological influences of this nature at present superficially attributed to "pure laziness."

Alimentary System.—The item under this head most warranting attention is that of teeth. It will be seen that about one-third of the population have good teeth or teeth which have no abnormality other than is explicable on the ground of lack of care while one-third have teeth so poor as to force the conclusion that an unusually destructive process has been at work. About 21% show abnormality of shape and placing. Among the cases of "very poor" teeth are 6% showing unquestionable signs of congenital syphilis. This diagnosis has not been made by teeth signs alone but by co-ordinating other signs which make conclusion certain. In addition to the cases definitely diagnosed are several which show teeth signs strongly suggestive of congenital syphilis, but since the aim of this paper is to remain invariably on the conservative side in diagnosis these cases have not been enumerated.

Respiratory System.—Shows tonsils (faucial) pathological 53% and naso-pharyngeal obstruction 23%. Only 4% of cases had received operative treatment for this eminently hampering abnormality. Obstructed breathing from whatever source is a potent excitant of nutritional disorders. It is therefore more or less reasonable to regard it at least as a contributory cause of behavior abnormality. In most of the cases cited the irritating influence has been at work for years and while no sudden change may be expected from its removal, nevertheless it is a duty to correct such defects in any who come under the jurisdiction of the state for reform of conduct.

In view of poor hygienic background it is surprising that so few of the cases show signs of pulmonary tuberculosis. This result is no doubt attributable to the fact that the active educational campaign carried on for some years has finally brought it about that incipiently tubercular persons are detected and properly cared for before reaching a penal institution. Only one individual from this group of two hundred persons had received sanatorium treatment for tuberculosis. 3% were regarded on admission to the institution as cases for special prophylactic attention.

Cardio-Vascular System.—Because of their relation to fatigue, to industrial inefficiency, to emotional and other mental and nervous variations it would seem that disorders of cardio-vascular mechanisms might be ranked among the most important of the somatic factors in determining or influencing conduct reactions. Under this category 18% of cases exhibited Tachycardia, 10% Arrhythmia, 2½% had constant pulse rate of 52 (three feeble-minded girls), 8% had organic valvular lesions. Among the seven in Group A. having valvular lesions, four are syphilitic, one is epileptic and feeble-minded, one is feeble-minded, one is psychopathic with disorder of the thyroid function, one of the syphilitics is also feeble-minded and one is hypomanic.

Blood pressure was measured with the Tycos sphygmomanometer. The data under this head seem to show, (1) a tendency for the higher pressures to occur in the cases of psychopathic make-up; (2) the lower pressures to occur in the feeble-minded cases. The eight cases not examined comprise six of the most deeply feeble-minded of the group and two borderline cases.

The cases (22) with Pulse Pressure of 30mm or less are distributed as follows:

Feeble-minded	10
Feeble-minded border	2
Drug habitues	3
Psychopathic personalities	3
Average reformatory type.....	4

The cases (19) with Systolic Pressure below 100 are distributed as follows:

Feeble-minded	13
Drug	2
Psychopathic	2
Normal average type.....	2

It seems fairly evident that the lower blood pressures occur in the lower grade mentalities as well as that the blood pressures for the entire group are lower than those given for a general population. Woley⁴ gives the average systolic pressure for 1,000 women at all ages at 120mm. Faught's⁵ figures for normal young adults are Systolic 120, Diastolic 80, Pulse pressure 40. The figures of this study are Systolic 107, Diastolic 70, Pulse pressure 37. Our findings seem to

⁴Woley, H. P.: The Normal Variation of Systolic Blood Pressure. The Journal A. M. A., July 9, 1910, p. 121.

⁵Faught. N. Y. Medical Journal, Feb. 27, 1915, p. 396.

indicate that low blood pressures and defective physical and mental make-up are somehow interrelated.

Genito-Urinary System.—Under this head, if the concomitants of venereal infection are excluded, no features of importance appear. Doubtless any non-criminal group of women would show as many abnormalities. Discrepancy between the large number of cases showing by blood test venereal infection and the small number showing it by verbal history and by clinical signs has been mentioned in the discussion of previous health. The following table shows this relation:

	Verbal History.	Clinical Signs.	Blood Test.
Syphilis.....	17½% (Not differentiated by subject)	11%	53%
Gonorrhœa.....		31%	69½%

With only 13½% of this population showing by blood test freedom from all venereal infection the question of treatment becomes at once a serious problem. Obviously it should be the duty of reform institutions to cure venereal disease in patients committed to their custody but at present in few if any is radical curative treatment of these conditions pursued. The public has a right to expect and in its complacent ignorance doubtless does expect, if it takes the trouble to think about it at all, that its wards receive at the hands of those whom it employs to care for them whatever treatment is necessary to restore them to the community in as nearly a normal condition of mind and body as is consistent with present day knowledge. It is a wasteful and unjust act for the state to isolate for a period of years individuals for purposes of correction only at the end of that period to send them out uncured of syphilis with the result that subsequently serious destructive lesions sends them again into dependence on the state. Cure of syphilis must be established as a basis for potential reform of the individual. Furthermore it is necessary to forestall the danger of bringing into life individuals congenitally syphilitic. At the Waverly (Mass.) State School for Feeble-minded, Dr. Fernald⁶ reports 10% of the population congenitally syphilitic. The subjects of our study show a minimum of 6% as already cited. It must be kept in mind that the rating here given is a strict minimum and that it is fair to suppose a somewhat larger number since "it is well known that the classical signs of hereditary syphilis are frequently absent in the subjects of syphilitic hereditary." (Marshall, "Syphilis and Venereal Disease" p. 347.)

The peculiar import to this study of the question of congenital syphilis is illustrated by a quotation from the same author (p. 322)

⁶Fernald, W. E.: Lecture, Feb. 8, 1916.

as follows: "The hereditary transmission of syphilis is one of the chief factors in physical, moral, and mental degeneration." The question here naturally raises itself whether degeneration of moral and mental attributes in persons afflicted with congenital syphilis (hereditary as applied to syphilis is a misnomer) is after all the result of solely toxic influence or whether as is more likely those mental and moral characteristics which have led a parent to become syphilitic do not operate in the offspring thro the more subtle process of heredity which would manifest in mental and moral abnormality regardless of the syphilitic toxine. In other words the mental and moral traits are inherited. Whatever influence syphilis exerts on offspring is through direct infection of cell structure and is therefore a physical effect pure and simple.

The "free from disease" ($13\frac{1}{2}\%$) as indicated by our figures is assuredly too high since this item was compiled on the record of blood test alone.

Nervous System.—The question of relation of abnormalities of the nervous system to modes of conduct is at present little more than a speculation. It would seem however that if in any bodily condition a correlation to conduct could be established it should appear in the field topographically nearest to that portion of the brain in which moral and ethical reactions are generally assumed to have their inception. If conduct is conditioned through any biological mechanism, more particularly through nervous mechanisms it would seem that wherever conduct abnormality exists some of the normal adjustments of the nervous mechanisms would constantly fail and that these failures would appear in examination. With a view to determine whether such correlation does exist in any significant degree details of examination of the nervous system were carefully scrutinized, first the cranial nerve as entities, and secondly other sensory and motor phenomena accessible to examination methods.

Conclusion.—Finally to evaluate accurately either the prevalence of physical defects or their relation to the occurrence of delinquency, it would be necessary to compare the data here given with data obtained from examination of non-criminal women of parallel age and social grade; in other words the non-criminal sisters, cousins, and associates reared in the same nutritive and hygienic medium as the subjects of this study. Lacking such data for comparison we can deal only with the facts as they stand and compare them with an abstract standard of physical perfection or normality. With such a standard in mind

our results show an exceedingly high degree of physical defect. The data have been carefully scrutinized for cases free or approximately free from physical defect. Seven cases from Group A and nine from Group B have been so adjudged. Where only one or two minor defects appear the case has been included in the above count. For example: one case is free from apparent defect except a moderately enlarged but unsymptomatic thyroid gland and hypertrophied tonsils; another is an excellent specimen except a large scar resulting from cervical adenitis in early life and so on. On the whole however the cases enumerated under this head are so far superior to the others that by contrast they must be regarded as approximately free from physical defect. In making up this statistic cases showing positive blood tests for syphilis and gonorrhoea have not been excluded, but it is certainly begging the question to class a person infected with either disease as physically perfect.

The mentality of the subjects classed free from physical defect is for the most part of the better grade. Five from the sixteen thus ranked free from physical defect were regarded on entrance examination as borderline cases requiring further study for diagnosis. One of the five was a morphine habitue. The others were among the more capable and intelligent of the group.

Under the discussion of each head of the examination blank attempt has been made to point out something of the relation between delinquency and the particular defect noted. It need hardly be added that each item touched on has further relations and ramifications which could be discussed at a length impossible in this survey. Here and there in the course of discussion effort has been made to correlate what seem to be the more significant defects with the mental status. This has been done to emphasize the fact that a considerable number of the subjects need no further interpretation to account for the occurrence of abnormal conduct. They are diagnosable entities, feeble-minded or psychopathic, who should not form a part of a reformatory population at all. A study of their physical defects should dovetail with a study of their intrinsic mental abnormality rather than with the purely incidental reaction of conduct.

From the data presented we derive the following generalizations:

1. The group of women here studied is characterized by a high degree of physical defectiveness.
2. The physical defects are, or were primarily, to a large extent

preventable in that they are the result of faulty nutrition, bad hygiene, bacterial infection and other concomitants of unintelligence and poverty.

3. The physical defects resulting as they do in some degree of discomfort and inefficiency unquestionably played some part in the conditioning of delinquency. What that part exactly is can be determined only by special study of the individual in whom the defect is found.

The conclusions arrived at obviously contribute nothing unique to the question in hand. They merely emphasize by repetition the fact now generally accepted by modern criminologists that physical defect is one of the factors conditioning abnormal behaviour. If, now, society is sincere in its constantly expressed desire to do away with criminal reactions it must, in order to clear the way for operation of other constructive measures, prevent or correct to whatever extent possible, physical defects in its citizens. The "New Penology" so fluently talked today has nothing to hope for unless it finds its work on approximately normal physical bodies.

The writer cannot close this study without mentioning what seems after personal contact with the problem to stand out as the most compelling conviction of the experience namely, that in our zeal to demonstrate some obscure scientific fact at the base of delinquency we swallow the camel while straining at the gnat. We institute with naive enthusiasm intricate laboratory research or, impatient at the roundabout methods of science, we put into immediate practice in our penal institutions some high ethical formula. We journey about the earth to confer on the historical, the psychological, the philosophical, the eugenic aspect of crime. We, in short, talk all around the edges of the subject meanwhile closing our eyes except for an evasive squint to the one clearly evident fact that at the base of practically all cases sentenced to reform institutions is the one common fact of poverty. Not necessarily the classic poverty of the empty cupboard and the threadbare garment but poverty in its widest sense. That kind of poverty which conditions from birth inadequate nutrition, dirty and unattractive living quarters, meagre education, too early wage-earning, tawdry and vulgar recreational pursuits, absolute lack of æsthetic training and of intelligent home companionship or guidance. In short that kind of poverty which prohibits the operation of cultural influences of any sort. The subjects of our study bear out this hypothesis since

only 5% of the cases had in childhood surroundings that approached even a minimum grade of culture or of wholesomeness.

Discussion of the socio-economic aspect of the problem may, quite properly, be considered out of place in a study such as this. When however the truth is faced that the high degree of physical defectiveness shown by this investigation is the result primarily of adverse socio-economic conditions it seems like futile dilettantism to treat any other phase of the problem before striking at the root.